Auxin - oxylipin crosstalk in stress responses of plant roots

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Plants use a complex hormone-based network to regulate their growth and development.

The Vick and Zimmerman pathway of jasmonic acid biosynthesis
Indole-3-acetic acid and Jasmonic acid - two on the first sight antagonistically acting signaling molecules

Auxins
- Growth promoting
- Apical dominance
- Tropisms
- Shoot elongation
- Induction of cambial cell division activity
- Formation of lateral- and adventitious roots
- Fruit development

Jasmonates
- Growth inhibiting
- Senescence promoting
- Plant defense
- Male fertility
- Flower development
- Mechanotransduction
- Tuber formation

The auxin/Jasmonic acid double mutant is a valuable tool for the uncoupled analysis of OPDA- and JA-triggered responses

YUCCA flavin-containing monoxygenase-like proteins are recognized as key enzymes in auxin synthesis, catalyzing a rate-limiting reaction step
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Transient expression of 3SS:YUC8 and 3SS:YUC9 after introduction into A. thaliana leaves.

Constitutive and stable overexpression of 3SS:YUC8 and 3SS:YUC9 in A. thaliana.

YUC8- and YUC9-GFP fusion proteins are exclusively located to the cytoplasm.
The YUC9 and YUC9 genes are differentially expressed during development and show reasonable expression in roots.

YUC8 and YUC9 are presumably not involved in lateral root initiation, but rather contribute to lateral root out-growth.

The exogenous application of methyl jasmonate (MeJA) induces the expression of YUC9 and YUC9.

Wound-induced production of endogenous jasmonate is sufficient to induce the expression of the YUC9 gene.
qRT-PCR analyses corroborate the differential impact of oxylipsins on YUC8 and YUC9 gene expression.

Relative to wild type, yuc8- and yuc9 mutants have reduced IAA contents and display reduced IAA production in response to MeJA treatment.

yuc8- and yuc9 mutants can be distinguished from wild type as they have shorter hypocotyls and petioles as well as a reduced lateral root density.

yuc8- and yuc9 mutants are characterized by a reduced responsiveness to MeJA treatment.